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The Impact of Full-Day Kindergarten on Learning Outcomes and Self-Regulation Among Kindergarten Children at Risk for Placement in Special Education

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Abstract

Two-year, play-based, full-day kindergarten (FDK) has been shown to have long-term academic and self-regulation benefits for young children. This article addresses the question of whether FDK has particular benefits for children who may be at risk for placement in special education. Participants included 592 kindergarten children in their second year of kindergarten, with an average age of 5 years, 9 months. Parent reports indicated that 56% of the children spoke a language other than English at home. The research design exploited a natural experiment that occurred due to the phasing-in of FDK, creating two groups of children who attended either FDK or half-day kindergarten (HDK). Kindergarten children's outcomes in vocabulary, reading, writing, mathematics, and self-regulation were used to create two achievement groups based on data cut-points: below average and average to above average. Following a series of binary logistic regression analyses, results showed that HDK children were significantly more likely than FDK children to be in the below average group in the areas of reading, vocabulary, and self-regulation. In fact, results for self-regulation showed that HDK children were three times more likely to fall into the below average group. These results are consistent with our larger study on the longitudinal impact of FDK to Grade 3. The article discusses the importance of play-based learning in fostering self-regulation and providing opportunities for small-group learning in the FDK program. For children who struggle academically, full-day learning through play with the

guidance of an educator team may present additional benefits.

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Abstract

Two-year, play-based, full-day kindergarten (FDK) has been shown to have long-term academic and self-regulation benefits for young children. This article addresses the question of whether FDK has particular benefits for children who may be at risk for placement in special education. Participants included 592 kindergarten children in their second year of kindergarten, with an average age of 5 years, 9 months. Parent reports indicated that 56% of the children spoke a language other than English at home. The research design exploited a natural experiment that occurred due to the phasing-in of FDK, creating two groups of children who attended either FDK or half-day kindergarten (HDK). Kindergarten children's outcomes in vocabulary, reading, writing, mathematics, and self-regulation were used to create two achievement groups based on data cut-points: below average and average to above average. Following a series of binary logistic regression analyses, results showed that HDK children were significantly more likely than FDK children to be in the below average group in the areas of reading, vocabulary, and self-regulation. In fact, results for self-regulation showed that HDK children were three times more likely to fall into the below average group. These results are consistent with our larger study on the longitudinal impact of FDK to Grade 3. The article discusses the importance of play-based learning in fostering self-regulation and providing opportunities for small-group learning in the FDK program. For children who struggle academically, full-day learning through play with the guidance of an educator team may present additional benefits.

As governments around the world continue to pay more attention to the importance of early childhood education and care in promoting short- and long-term well-being, there has been a concomitant interest in research on the effectiveness of early years programs (e.g., Melhuish, 2018; Pelletier, 2017; Pelletier & Corter, 2018). Short-term benefits of high-quality preschool and full-day kindergarten (FDK) include improved literacy, mathematics, and self-regulation in children (Cooper, Batts Allen, Patall, & Dent, 2010; Larson, Russ, Nelson, Olson, & Halfon, 2015; Lee, Burkam, Ready, Honigman, & Meisels, 2006; McCoy et al., 2017; Yan & Lin, 2005) and reduced stresses for parents, particularly working parents (Arimura, 2008; Stover & Pelletier, 2018). Longer term benefits include greater academic success (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2009), reduced incidence of crime, improved health outcomes and less dependence on social services (Moffitt et al., 2011; Peters et al., 2016). There is increasing evidence that dollars spent early can offset later costs incurred by compensatory initiatives, for example, remarkable economic payoffs such as many dollars returned for every dollar spent (Alexander, 2017; Fortin, 2018; Reynolds, Temple, White, Ou, & Robertson, 2011).

Given the powerful relationship between early learning programs and later success, a natural question follows: Does this relation persist among all populations of children? For example, do children who are learning in an additional language, such as English language learners (ELL), fare as well as children whose home language is the same as the language of the early education setting? Some research suggests that they do; benefits for ELL children are as great as or greater than they are for children learning in English as a first language (EL1). There is increasing evidence that FDK is particularly beneficial for children from diverse language backgrounds (Bingham & Hall-Kenyon, 2012; Chang, 2012; Chang & Singh, 2008; Preston, Cottrell, Pelletier & Pearce, 2012; Puleo, 1998). For example, Bingham & Hall-Kenyon (2012) showed that both ELL and non-ELL children in FDK settings performed significantly better in literacy and mathematics when compared to children in half-day kindergarten (HDK). Other research has shown that although there are impressive gains for ELL children, the effects of early learning programs may be initially stronger for EL1 children's vocabulary because they are further increased when children are learning and speaking in a familiar language (Bingham & Hall-Kenyon, 2012; Pelletier & Corter, 2018). In both cases, ELL children benefit greatly from high quality early learning programs.

Similarly, early childhood education and high quality care have been shown to have even greater benefits for families with lower income and education levels than for families who experience fewer socio-economic challenges (Brownell et al., 2015; DeCicca, 2007; Hahn et al., 2014; Melhuish, 2018; Moon, Hegar, & Page, 2009; Schroeder, 2007; Warburton, Warburton, & Hertzman, 2012). Further, quality of programs matters most for these children. Indeed, high quality early childhood education can narrow the equity gap in achievement between children of well-educated and less-educated parents (Melhuish, 2018), reinforcing the importance of provision of high-quality, monitored early learning programs.

Another question pertains to children who may be at risk for later special education services. In a public policy report, Philpott, Young, Maich, Penney, and Butler (2019) advocated for high quality, inclusive, early learning opportunities as a way to reduce

special education needs in young children. This has the expected longer-term benefit of improving developmental outcomes for children at risk for later special education needs. Referring to special needs analyses carried out with the Effective Pre-School and Primary Education (EPPE) data (e.g., Melhuish, 2018; Sammons et al., 2003; Sylva et al., 2009), Philpott et al. (2019) noted that children who were tracked into primary school and who had been part of the EPPE project were less likely to be referred to special education. Beyond the EPPE study, Philpott et al. (2019) claimed that a more general lack of data-driven research on the pre-emptive nature of early childhood services has led to uncertainty in policy decisions and provision of programs that might have preventative benefits to children at risk. Research on universally accessible early learning programs must begin to address this question. Can government-run education policy for all children have particular pre-emptive benefits for children at risk? In particular, can a provincial policy for two-year FDK make a difference for the most vulnerable children? This is the question to which we turn our attention in this article.

Methods

Context

The data for the current study were drawn from a longitudinal study examining the implementation and impact of two-year, play-based FDK in Ontario, Canada (Pelletier & Corter, 2018). Although kindergarten is not a mandatory program, it is taken up by almost all families in Ontario (Friendly, Grady, Macdonald, & Forer, 2015). Children are eligible to attend FDK at the public school in their neighbourhood catchment area. The study followed the roll-out and the longer-term effects of play-based FDK since its inception in 2010. In addition to the new, two-year full-day schedule, the government introduced a revised play-based curriculum, co-taught by a registered early childhood educator and a certified teacher. That is, children in FDK programs were now experiencing full days of learning through high-quality, intentional play. Learning expectations were met with the facilitation of educators paying attention to and extending children's interests. HDK children continued with the previous curriculum that was based in play but that required a greater proportion of overall kindergarten time in instruction in order to meet learning expectations within the shortened day. That is, rather than 2.5 hours of play and instruction in HDK, FDK children receive double that time, with more time allotted for play, co-facilitated by two educators. The new draft version of the FDK program (Ontario Ministry of Education, 2010), used by FDK educators in this study, included the play-based approach with specific overall and specific learning expectations in five curriculum areas. There was now more time for children to fully develop their play through choice and inquiry. FDK educators receive professional development on how to use inquiry and play in pedagogical practice. Pre-service and in-service kindergarten teachers are trained in the methodology of play and in the policies of the Ontario school system for assessment and reporting; early childhood educators bring professional training in child development and play through their 2–4 year training programs. FDK class sizes maintain an adult–child ratio of 1:13 with an average class size of 26 and two educators. In addition to the unique staff team and play-based methodology, FDK provides two years of full-time high quality early education for 4-year-old junior kindergarten and 5-year-old senior kindergarten. HDK was taught for two

half-time years by one teacher. Curriculum expectations needed to be met within a shorter timeframe; literacy and numeracy skills were most often taught directly rather than through play. In addition, HDK children who required child care for the other half day needed to be transported to another locale for child care unless care was provided at the school. Our own and other research has shown that children recognize the transitions in fragmented days that occur between kindergarten and child care (Arimura & Corter, 2010; Pelletier, 2012). Some school boards have adopted the *seamless day* approach that includes before- and after-kindergarten care that is integrated with FDK early learning (Janmohamed, McCuaig, & Akbari, 2014).

Capitalizing on the 5-year phasing-in of FDK, it was possible to use HDK as a natural control group to compare with FDK on questions related to program effectiveness. As reported in our previous publication (Pelletier & Corter, 2018), the initial schools from which participant children were recruited included 9 FDK sites and 9 HDK (control) sites. HDK schools were matched demographically to FDK schools through a partnership with school boards. HDK schools were selected for our study if they were eligible for FDK based on similar neighbourhoods but were not selected for the first round of FDK implementation. As the government phased in FDK, schools were first selected based on neighbourhood profiles. Many school boards in Ontario used social risk factors to select early implementation schools. In the region where this research was carried out, the Social Risk Index comprises nine census variables: average household income, unemployment rate, education level, owner-occupied dwellings, mobility, knowledge of Canada's official languages, recent immigrants, lone parent families, and government transfer payments. Risk clusters include five categories of risk ranging from 1 (low risk) to 5 (high risk). As reported previously (Pelletier & Corter, 2018), although FDK had higher mean risk index scores, both HDK and FDK schools fell in the high risk category. It was also necessary for FDK schools to have the space and infrastructure to support the full-day program; thus some schools remained HDK until space was available in subsequent years. Prior to the implementation of FDK, publicly available provincial test score data showed that HDK schools had somewhat higher Grade 3 provincial test scores. Overall both FDK and HDK schools had lower provincial test scores than the rest of the school board. Mothers' education level ranged from "some elementary school" to "graduate degree" and was statistically significantly lower in FDK than in HDK. Mother's Education was controlled in all analyses. Thus, our matching process may have advantaged only the HDK group and did not favour the FDK group. Interpretation of findings should consider that our results might have been even stronger if matching had equally favoured FDK. Using both quantitative and qualitative methods of data collection, we collected information on children's academic and social outcomes as well as student and parent perspectives and children's drawings. Data were collected in the spring term of each year; it was not possible to collect pre-test data prior to the implementation of FDK, as our research began during the first year of its implementation. After parents provided written consent and children gave verbal assent, children participated in learning tasks and games with a trained graduate student researcher near the children's classroom for 45 minutes to an hour. The direct measures of children's experiences and performance allowed us to ask whether the FDK program might have differential benefits for groups of children.

Participants

The larger study measured implementation and impact of FDK on staff teams, parents and children (Pelletier & Corter, 2018). The data reported here pertain to the children during the senior kindergarten year because all FDK children in the study experienced senior FDK. Due to the phasing-in of FDK over five years some children began FDK in junior kindergarten and some began in senior kindergarten. Participants included 592 senior kindergarten students enrolled in either HDK or FDK (see Table 1). Ages of the children in senior kindergarten ranged from 63 months (5 years, 3 months) to 76 months (6 years, 4 months), with an average age of 69 months (5 years, 9 months). No students were officially identified in kindergarten as having special needs, because special needs are typically not identified until later grades. The group of participating students was ethnically and linguistically diverse; fewer than half reported speaking English at home. In the FDK group, 51% were ELL, while in the HDK group, 61% were ELL.

Table 1.
Descriptive Statistics (N= 592)

Variable	<i>n</i>	%	Variable	<i>n</i>	%
Gender			Language Proficiency		
Female	283	48	ELL	329	55.5
Male	309	52	EL1	263	44.5
Program			Home Language		
Full-day kindergarten	328	55.5	English	268	45.5
Half-day kindergarten	264	44.5	Cantonese	88	15
FDK Enrolment			Punjabi	62	10.5
0 years	264	44.5	Urdu	29	5
At least 1 year	328	55.5	Spanish	19	3
Birth Country			Tamil	18	3
Canada	164	27.5	Arabic	15	2.5
India	129	22	Hindi	12	2
Pakistan	27	4.5	Unspecified	14	2.5
Sri Lanka	23	4	Other ^a	67	11
China	16	2.5	Mother's Education		
Phillippines	15	2.5	Some high school	15	2.5
No response	100	17	High school graduate	77	13
Other ^a	118	20	Some college or university	108	18.2
Age (months)	<i>M</i>	<i>SD</i>	University graduate	188	31.8
	69.19	4.00	Graduate degree	96	16.2
			Graduate + Professional	18	3
Range (months)	54–85		No response	88	14.9

^a. "Other" categories included 48 additional countries and 21 additional languages that each represented less than 2% of the total population.

Measures

Vocabulary. The Peabody Picture Vocabulary Test, Third Edition (PPVT-3) was used as a measure of vocabulary development; the third edition was used to be consistent with previous related research. The test, developed by Dunn and Dunn (1997), is a measure of receptive (hearing) English vocabulary that can be used with children as young as 2.5 years of age to adults of 90+ years. The test is designed as a single scale consisting of 19-item sets, or lists of terms, with corresponding image cards. A raw score is calculated then converted into standard scores, percentiles, normal curve equivalents, stanines, approximate age and grade equivalents, and growth scale values. Scores on the PPVT can be used to identify language deficits, disorders, or special learning needs, and to guide educational instruction. These scores have also been used as an alternative to the intelligence quotient (IQ) popularly used as a measure of cognitive or reasoning skills. Standard scores were used in the analyses.

Reading. The Test of Early Reading Ability, Third Edition (TERA-3), developed by Reid, Hresko, and Hammill (2001), is a measure of reading for children 4–8 years of age. Specifically, the TERA tests the mastery of specific skills exhibited by successful early readers. This test is comprised of three subtests that use both pictures and text: Alphabet, Conventions, and Meaning. The Alphabet subtest assesses children's alphabet knowledge, including letter–sound correspondence, syllables, and printed letters. The Conventions subtest assesses children's understandings of the conventions of print, including where to begin reading, handling books, spelling, and capitalization. The Meaning subtest assesses children's ability to understand, or take meaning from, letters, words, sentences, and paragraphs. Raw scores on each subtest are calculated and standardized, then combined to produce a reading quotient score of overall reading ability. Total Reading Quotient (standard score) was used in the analyses.

Print task (early writing). In this task (Pelletier & Lasenby, 2007), children are asked to write a short sentence including numbers and words, for example, “Teacher has five little red crayons,” using their choice of colored markers, pencil crayons, and lead pencils. Scores on the writing portion of this task range from 1 (for scribble) to 13 (for correct spelling).¹ In order to assess reliability of the coding, 10% of the writing samples are scored by two individuals. The number of agreements is divided by the number of agreements plus disagreements with the goal of reaching a reliability score of greater than 80%. In cases in which there are disagreements, researchers discuss the coding until agreement is reached. Raw scores are calculated controlling for age.

Number knowledge. Number knowledge was measured with a widely used developmental measure (Okamoto & Case, 1996) of children's growing understanding of numerical concepts and relationships. Concepts such as less and more, bigger and smaller, addition and subtraction, and class inclusion form the basis for the kindergarten assessment. For example, the concept of less and more involves the child looking at two short stacks of poker chips and stating which stack has more. More advanced items

¹ The complete coding protocol for this task, including scoring of number, is available from Janette Pelletier, janette.pelletier@utoronto.ca.

include mental computation of two- or three-digit addition and subtraction and other mathematical concepts. Total raw scores are calculated controlling for age.

Self-regulation. The Head, Toes, Knees, Shoulders (HTKS) task (Cameron Ponitz, McClelland, Matthews, and Morrison, 2009), is a measure of children's behavioural self-regulation. The HTKS is a game-like task that measures children's inhibitory control, their ability to switch rules in the game, and their working memory. Children practise some actions (e.g., touch their head, touch their toes), then are asked to perform the opposite action when given an instruction. For example, when asked to touch their toes, children with good inhibitory control can suppress the urge to do follow that request and instead touch their head. Working memory is involved, as children must keep in mind what they were asked to do in order to perform the opposite action. Cognitive flexibility involves being able to switch perspectives and actions, such as head to toes or knees to shoulders. The HTKS is divided into three sections, each with practice and test items, that become progressively difficult as children move through the sections and new instructions are added. We chose to use two sections for kindergarten children. A sum score was totalled from scores on each of the two sections. Total raw scores on the HTKS were used in the analyses, controlling for age.

Results

To understand the predictive nature of FDK, a series of binary logistic regressions was conducted using SPSS version 25 (IBM, 2017). These regressions were used to predict placement into one of two achievement groups on academic measures depending on participation in HDK or FDK (see Table 2). Two distinct groups for each of the measures were created: *below average achievement* and *average to above average achievement*, following procedures used in a study of the long-term impact of 3,167 children's enrolment in early childhood education programs for later risk of special education needs in early childhood centres across the United Kingdom (Melhuish, 2018). Melhuish (2018) argued that, though meant to be consistent, the use of standard deviation cut-points to classify students in need of special education supports varies. Therefore, by using a standardized measure of special education identification one can mitigate this variability. Using this method, Melhuish (2018) found that children who were enrolled in early childhood education programs were at a decreased risk for special education needs, with this result persisting from ages 5 to 16 years.

Program (HDK or FDK), with age, gender, and mother's education level as control factors, was used as the predictor variable in all of the regression analyses to determine whether type of kindergarten programming would predict achievement on academic outcomes. The results are explained in terms of odds ratio. Figure 1 displays resulting odds ratios for all measures used in analyses. This statistical value measures the strength of the relationship between two variables on a numeric scale. In the case of the results reported here, the strength of the relationship was between each of the academic measures and the type of program. Consistent with Melhuish (2018), this prediction in the below average group identifies those most at risk for special education needs.

Table 2.
Logistic Regression Coefficients (B) and Odds Ratios for
Below Average Academic Achievement Based on Kindergarten Programming

Outcome (measure) Predictor	B (SE)	Odds ratio ^a	95% Confidence interval	
			Lower	Upper
Vocabulary (PPVT)				
Program	.67 (.25)	1.96*	1.20	3.20
Reading (TERA)				
Program	.88 (.24)	2.42**	1.51	3.87
Writing (Print Task – Writing)				
Program	-.05 (.21)	.95	.63	1.43
Number Knowledge (Number Sense)				
Program	.33 (.21)	1.39	.92	2.12
Self-Regulation (HTKS)				
Program	1.20 (.30)	3.33**	1.86	5.97

^a. Bolded values represent significant findings; * Significance < .05; ** Significance ≤ .001

Figure 1. Probability of HDK Below Average Achievement in Odds Ratios

Odds ratios quantifying the probability of students in HDK obtaining scores below the average, compared to their FDK peers, thereby making them at risk for special education needs.

* Asterisk denotes significant results.

We began by examining mean scores for ELL and EL1 children. There were no differences on any of the measures, except reading (TERA, see below). We controlled for child age, gender, and mother's education level in all analyses reported here.

Vocabulary

An initial hierarchical logistic model was fitted to the data. Age, gender, and mother's education level were all fitted to the first block of the model. This model, compared to the null model (a model with no predictors), produced statistically significant results, $\chi^2(4) = 25.09, p < .01$, with 77.5% of cases correctly classified by the model with predictors. Further, a significant positive odds ratio ($e^{0.67} = 1.96$) of program was observed. The positive regression coefficient ($B = .67$), a value proportionally bound between 0 and 1, can be interpreted as every one-unit increase in the predictor corresponding to a one-unit increase in the outcome. That is, as the odds of being in the below average performance group increased, so too did the odds of being in HDK. The odds ratio can be further interpreted as indicating that the odds of students in HDK being in the below average group on this test of vocabulary were almost two times higher than for FDK students.

Reading

A hierarchical model was fitted to the data using TERA reading quotient scores as the outcome variable. This model was statistically significant, $\chi^2(4) = 40.87, p < .01$, with 72.7% of cases correctly classified by the model with predictors. A significant positive odds ratio ($e^{0.88} = 2.42$) was produced. These results indicated that the increased odds of students belonging to the below average group on tests of reading directly corresponded to the increased odds of being in HDK, with HDK students being 2.5 times more likely than FDK students to belong to this below average group on the same tests of reading. Due to the difference in mean scores between ELL and EL1 children on this measure, we reran the regression analysis, including ELL as a control variable. Without controlling for ELL, program type had a beta value of 2.42 and was significant at a p -value of .000. The HDK children were 2.4 times more likely to be in the below achieving group than the FDK children. When including ELL as a control variable, program type had a beta value of 2.34 and was significant at a p -value of .000. The HDK children were 2.3 times more likely to be in the below average performance group than the FDK children. There was therefore no meaningful difference in specific benefits for ELL children.

Writing

A hierarchical model was fitted to the data using Print Task-Writing scores as the outcome variable of interest. This model was statistically significant, $\chi^2(4) = 30.59, p < .01$. Upon closer examination, however, we observed that program did not produce a significant odds ratio ($e^{-0.05} = 0.95, p = .80$) suggesting that whether the student was enrolled in HDK or FDK did not have an impact on the likelihood of their membership in the below average performance group on this test of writing. Alternatively, these findings could suggest insufficient data to reveal any statistically significant differences between the two program types. The significant model produced here can be explained by the

additional age and gender predictors; regardless of programming, age and gender significantly predicted achievement in early writing.

Number Knowledge

A hierarchical model was fitted to the data using number knowledge scores as the outcome variable. This model also produced results that were statistically significant, $\chi^2(4) = 49.55, p < .01$, with an insignificant odds ratio for program ($e^{0.33} = 1.39, p = .12$). This suggests that HDK or FDK did not have an impact on the likelihood of children's membership in the below average performance group on this test of early mathematics learning. Similar to the findings related to writing, it is possible that the data were not sufficient to reveal any statistically significant differences between the two types of kindergarten programs. The significant model produced here can be explained by the additional age and gender predictors; regardless of programming, age and gender significantly predicted achievement in early mathematics learning.

Self-Regulation

A hierarchical model was fitted to the data using student scores on HTKS as the outcome variable. This model was statistically significant, $\chi^2(4) = 24.29, p < .01$, with 68.4% of cases correctly classified by the model with predictors. A significant positive odds ratio ($e^{1.20} = 3.33$) was observed. This can be interpreted as indicating that as the odds of performing below average on the test of self-regulation increased, so did the odds of being in HDK. Results further indicate that the odds of students being in the below average group on this self-regulation test were three times higher for HDK than for FDK students.

Discussion

In this article we address the question of whether universal FDK may provide particular pre-emptive benefits for children who are at risk for placement in special education. In order to do this, we employed data from our study on the implementation and impact of FDK in Ontario, Canada. The larger study follows children from their first year in kindergarten until the end of Grade 6. At the time of this writing the study is in progress; we report here on data from kindergarten. The results of the larger study to the end of Grade 2 with Grade 3 provincial test scores are available in Pelletier and Corter (2018).

Here we were interested in comparing FDK and HDK children who may be at risk for later placement in special education. We used our data on kindergarten academic and self-regulation outcomes to compare children in two achievement groups: below average and average to above average, based on cut-points of one standard deviation below the mean. Our procedure for this grouping is consistent with the EPPE research from the United Kingdom, which employed a large-scale database of young children's learning and development over time (Melhuish, 2018). We compared the groups for each of the following outcome measures: vocabulary, reading, writing, mathematics (number knowledge), and self-regulation. For each of the outcome measures, we employed binary

logistic regressions to predict placement into one of the two achievement groups. We then ran the analyses on each of the outcome measures.

Results for vocabulary, reading, and self-regulation showed that children at risk for later special education needs, based on their placement in the below average group, were significantly more likely to be in HDK than in FDK. Results for early writing and mathematics did not significantly differentiate between the two groups; however, age and gender were predictors of outcomes in those areas, regardless of programming. Interestingly for the standardized measures that take age into account, results significantly differentiated the two groups. Results for self-regulation showed that HDK children were three times more likely to fall into the below average group and FDK children were more likely to fall into the average and above average group. These results are consistent with those of our larger study on the longitudinal impact of FDK. Children from FDK programs, compared to children from HDK programs, remained significantly ahead in most of these outcome measures over time; the benefits of FDK were strongest in the areas of self-regulation and reading (Pelletier & Corter, 2018).

Why might FDK be associated with these improved outcomes, particularly for children who may be at risk for special education needs? Taking self-regulation as an example, FDK children have more time for high-quality, child-driven play, shown in numerous research studies to foster self-regulation skills (Bodrova & Leong, 2009; Diamond, Barnett, Thomas, & Munro, 2007; Diamond & Lee, 2011). Children themselves report that play is fun and important in kindergarten (Heagle, Timmons, Hargreaves, & Pelletier, 2017). Through pretend play, children learn to take the perspectives of others, to inhibit misbehaviour and to be more flexible in role-taking (Diamond et al., 2007). Research has shown that children are more self-regulated during play than during whole-group instruction and transition times (Timmons, Pelletier & Corter, 2015). For children who struggle, opportunities for self-regulation development are particularly important because there is a relation between self-regulation and academic outcomes (Cameron-Ponitz et al., 2009; Pelletier & Corter, 2018). The FDK program may allow more of these opportunities for self-regulation development among children at risk for special needs services.

As an academic example, FDK may help children in literacy both through the focus on play and through the opportunities for smaller group instructional time that can happen more often with two educators and a longer time in kindergarten each day (Pelletier & Moore, 2019). While many educators may see play as separate from literacy instruction but nevertheless co-occurring in FDK environments, other educators see play as the means to foster literacy (Fesseha & Pyle, 2016; Pyle & Danniels, 2017; Pyle, Priolella, & Poliszczuk, 2017). In both cases, literacy is given primacy despite the modality for its development. Small group instruction is more easily carried out with two educators than with one and smaller groups are associated more with greater self-regulation than are large groups (Timmons et al., 2015). For children who struggle academically, opportunities for small group time may not only increase self-regulatory behaviour but also may help children's literacy development (Hong, Corter, Hong, & Pelletier, 2012).

Limitations and Conclusions

There are a few limitations to our study that should be noted here. The first is that while the phased-in implementation of FDK in Ontario gave us a unique opportunity to exploit a natural experiment, the analyses are limited by a lack of randomization to FDK and HDK groups. Nevertheless, the collaboration with our partner school boards compensated greatly by attempting to match schools demographically. Second, we did not have consistent data on additional programming that either FDK or HDK children may have had. Although we asked parents to complete questionnaires about child care and other services, the responses were inconsistent; this may have been due to language barriers in this highly linguistically diverse population, despite providing translations when needed. Third, due to the timing of the research grant funding and the quick roll-out of FDK, it was not possible to acquire pre-test data on the children the year before they entered kindergarten; we therefore controlled for a range of demographic factors in all analyses. Finally, in the large majority of cases, schools and school boards do not assess children for special education needs during kindergarten. These assessments are generally carried out once children reach the primary grades. Therefore, our analyses pertaining to special needs were carried out by grouping children based on their scores on outcome measures. To address this issue, we used Melhuish's (2018) method of grouping children by one standard deviation below the mean on the outcome measures. Despite this limitation our grouping analyses pointed to significant benefits of FDK for children who may be at risk for special education needs.

In conclusion, our study provides evidence of self-regulatory and academic benefits of FDK for children who are most at risk for later special education needs. Our work adds to the literature on early years programs and policy promoting government support for FDK for all children, and particularly for those who are most in need. In our case a two-year, play-based FDK program co-taught by a professional team of an early childhood educator and a kindergarten teacher showed particular benefits for struggling children.

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